

and was north of Lake Huron, with a fall in the barometer of .22 in eight hours at Alpena, .26 at Saugeen, .25 at Rockliffe, which was .40 to .50 below the normal. A very heavy rain of 2.32 inches occurred at Alpena and 2.31 at Escanaba. The winds were fresh and high on the lakes, and continued until the morning in the eastern part of the lower lakes. On the morning of the 29th the centre was northwest of Father Point, with rains in New England and the northern part of the middle Atlantic states and in Nova Scotia. In the afternoon the centre was east of Anticosti, and from here passed over Newfoundland, whence it will be described as number 13 of the north Atlantic storms.

XVI.—This area developed in western Colorado about midnight of the 28th, with a pressure .20 to .30 below the normal. By the afternoon of the 29th the centre had moved northeastward and was near Yankton, with the pressure .41 below the normal. At midnight it was a severe storm in Minnesota, with the centre near Saint Paul, where the weather was threatening and the wind had a velocity of 27 miles. On the morning of the 30th the centre was over Lake Superior. Rain fell in Minnesota and the northwest part of the upper lakes, in the Ohio valley and in the lower lake region. A thunder storm occurred at Davenport, Iowa. In the afternoon of the 30th the centre was north of Lake Huron, and the rain continued in the lower lake region and in the southern part of the upper Mississippi valley. The winds on the lakes were not very strong. At midnight the centre was northwest of Quebec, with partly cloudy weather and local rains in the Saint Lawrence valley and in the lower lake region. The only high wind attending this storm was at Duluth, 41 miles, the morning of the 30th. At the midnight report cooler, clearing weather followed in the upper lake region, and clear weather in the northwest.

NORTH ATLANTIC STORMS DURING SEPTEMBER, 1884.

[Pressure expressed in inches and in millimetres; wind-force by scale of 0—10]

The paths of the atmospheric depressions that have appeared in the north Atlantic ocean during the month have been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels; from data obtained through the co-operation of the Hydrographic Office, U. S. Navy, and the "New York Herald Weather Service;" also from abstracts of the logs of Spanish steamers, furnished through the courtesy of the Reverend Benito Viñes, S. J., Director of Belen College Observatory, Havana; and from other miscellaneous data received at this office up to October 25, 1884.

To the Hydrographic Office, U. S. Navy, the Chief Signal Officer desires particularly to express his indebtedness for valuable information and data furnished through the kindness and courtesy of the officers there on duty.

The Chief Signal Officer calls the attention of co-operating observers to the importance of carefully noting each successive change of wind, especially when in the vicinity of tropical hurricanes, and, when practicable, the hour at which such change occurs; also the vessel's course and rate of sailing per hour, or her estimated drift when hove to.

The most noteworthy feature of the month of September was the occurrence of two tropical hurricanes during the first half of the month. The first of these originated to the eastward of the forty-fifth meridian and near N. 15°, moving thence west-northwestward to about W. 57°, where it recurved to the northeastward. The second hurricane appears to have developed near the coasts of Florida and Georgia, no observations having been received which point to its existence at a lower latitude, or prior to the 10th; the centre of this hurricane remained near the coast of the United States for three or four days, during which the disturbance exhibited great energy and finally moved northeastward along the course of the Gulf stream. The month was unusually stormy over the region south of N. 40° and between W. 20° and 40°. Several depressions passed northeastward at latitudes north of 50°, such

being, in general, continuations of disturbances which originated in the United States. The weather, during September, over that part of Atlantic between the United States and Europe, most frequented by steamers, may be summarized as follows: 1st to 20th, strong breezes to gales from sw. to nw; weather generally cloudy or rainy, frequent fogs west of the fiftieth meridian. From the 20th to 30th, moderate to strong gales, especially heavy over the region east of W. 40°, weather cloudy or rainy.

The following are descriptions of the storms charted:

1.—This disturbance appeared near N. 41°, W. 58°, on the 1st, and caused strong se. gales over the ocean south of Newfoundland. Captain Braes, commanding the s. s. "State of Nebraska," in N. 42° 30', W. 61° 45' reported as follows: "4 a. m., barometer 28.81 (756.9), wind se., force 5, hauling to eastward; ran into what was evidently the northern edge of a cyclone moving to the eastward, barometer (aneroid) falling .4 inch in two hours; very high sea from sw. At 6 a. m., barometer 29.4 (746.7), oscillating .2 inch, wind nne., force 9, very heavy rain; 9 a. m., barometer 29.6 (751.8) rising, wind nw., weather clearing; noon, barometer 29.9 (759.4), light wind, fine weather." The s. s. "Oder," in N. 43° 55', W. 58° 01', had a fresh sse. gale from 10 a. m. to 3 p. m., then from se. to sw., blowing with hurricane force, with heavy rain. The bark "Addie E. Sleeper," lost spars and sails during a heavy gale in N. 41° W 61°, and the bark "Engelbert," sixty miles east of Sable island, lost sails in a hurricane on the 1st; several vessels on the Banks had severe gales, and sustained loss of spars and sails. On the 2d, the centre of disturbance was to the northward of the fiftieth parallel, the minimum barometric reading being 29.36 (745.7); moderate to strong sw. breezes prevailed over the Banks, with s. and e. winds, north of 53° N., and east of 45° W. During the 3d, 4th, and 5th, the disturbance moved eastward north of the fifty-fifth parallel, the pressure ranging from 29.2 (741.7) to 29.6 (751.8). On the 6th, the area of low pressure was to the northward of the British Isles.

2.—This was a tropical hurricane which prevailed over the Atlantic south of the thirtieth parallel during the first decade of the month, having developed within the region south of 15° north latitude, and east of 47° west longitude. The earliest reports relating thereto, as yet received, date from the 3d of the month and are as follows: On the 3d Captain N. C. Walker, commanding the bark "Campanero," in about N. 13° 27', W. 47° 33', reported: "wild, threatening weather throughout the day; at 9 p. m. the wind was nnw.; at 10 p. m. nw. by w.; 11 p. m., wnw.; at 1 a. m. of the 4th it was w.; 2 a. m.; sw.; 3 a. m., s.; barometer 29.84 (757.9). The wind blew in heavy heavy and sudden squalls of about two minutes duration, with heavy rain and high seas; at 8 a. m. the barometer began to rise, but the squalls of wind and rain continued and a very rough and confused sea came up from s. and sw.; at noon the wind was blowing a strong breeze from ssw., with rain, and the sea became more regular."

On the 4th the bark "Ella," from Buenos Ayres to Boston, in N. 16° (no longitude given), had a heavy gale from w., in which she lost and split sails; and the brig "Emeline," on the same date, in N. 16° 23', W. 52° 24', had a heavy gale from nne. to ssw., lasting twelve hours. On the 5th Captain H. F. Schive, commanding the brig "Lilian," in about N. 17° 39', W. 57° 50', reported very heavy ene. and ese. sea swell, with cloudy, squally, and threatening weather and strong nw. wind until 2 p. m., when it began to blow in heavy squalls, with rain, from w. and w. by s.; barometer 29.79 (756.7). This weather continued for about six hours, when the wind shifted to sw. and blew with the force of a moderate gale.

The above vessels appear to have been to the southward of the storm-vortex, which was evidently moving in a westerly or west-northwesterly direction, as shown by the directions and shifts of the wind; it appears probable that they were, however, at a considerable distance from the vortex, since the wind with them did not exceed the force of a moderate to

fresh gale. On the 6th the brig "Comalo" encountered a hurricane in N. $18^{\circ} 58'$, W. $58^{\circ} 0'$, and put into Saint Thomas, September 23d, leaky and partly dismasted; the direction of the winds and observations have not been received from this vessel, but the damage she sustained shows that she was probably at no great distance from the storm-centre. The report of the s. s. "Plato," H. W. James commanding, indicates the position of the vortex on the 7th; the following is an extract of the log of that vessel:

Encountered a cyclone in lat. 22° N., long. 57° W., September 7, 1884.

September 5, 8 a. m., barometer 29.83 (757.7), wind sw. by s., fresh gale, heavy rain and high sea, vessel laboring and straining and shipping heavy seas over all. 12 m., wind ssw., barometer 29.82 (757.4), wind increased to a strong gale and gloomy weather and high sea. 4 p. m., wind south, barometer 29.81 (757.2), strong gale, continued same until 8 a. m., September 6, when wind shifted to se. by s., barometer 29.71 (754.6), strong gale, hard squalls and heavy rain. Hove to on starboard tack. 12 m., wind sse., barometer 29.76 (755.9), blowing furiously. 2 p. m., wind s. by e., barometer 29.72 (754.9), fresh gale, very hard squalls. 8 p. m., wind south, barometer 29.68 (753.9), increasing gale, very hard squalls. 12 midnight, wind s. by e., barometer 29.38 (746.2), strong gale. 4 a. m., September 7, wind sse., barometer 28.90 (734.0), strong gale, rain and mountainous sea. 8 a. m., wind se. by s., barometer 28.40 (721.3), blowing a hurricane, air thick with rain, and high sea, which swept over vessel. 9 a. m., wind se. by s., barometer 28.26 (717.8), broadened to on port tack. 10 a. m., wind suddenly lulled and veered to wnw., again blowing a hurricane, ship settled to starboard, gunwale in water. The wind then decreased gradually and barometer rose gradually.

The above shows that the hurricane had recurved and was then moving in a north-northeasterly direction. Through the courtesy of the Rev. Benito Viñes, S. J., director of the Belen College Observatory, Havana, reports have been received from two vessels which were in the eastern quadrants of this cyclone. The s. s. "Ciudad de Santander," D. F. Cimicón, commanding, reported: "7th-8th, the day began with threatening weather, fresh se. wind, heavy sea swell from sw. and w., and gradually falling barometer; 9 p. m., fresh se. wind, high, confused sea from sw. and w., heavy rain and violent squalls. The sky and horizon assumed a grayish color, and the sea became so furious as to prevent all headway; hove-to on the port tack until 12 hours, when it was blowing a strong se. gale, barometer falling until 15 hours, when there was a sudden fall from 29.88 (759.0) to 29.49 (749.0), with furious sea from se., s., sw. and w., threatening appearance and heavy rain."

"Judging that the centre of cyclone bore approximately sw. from the vessel, run ship to the northeastward in order to reach the manageable semicircle of the cyclone; barometer stationary at 29.49 (749.0); estimated position, latitude $25^{\circ} 42'$ N., longitude $52^{\circ} 52'$ west of Greenwich."

"Sept. 8-9th.—Strong se. gale, high sea from se., s., sw., and w., threatening weather, rain squalls and violent gusts of wind; at 10 p. m. wind hauled to sse. and blew with great force; very high sea; rain; barometer stationary at 29.49 (749.0). At 15 hours, put ship on the starboard tack; at daylight the wind hauled to s., no change in barometer; at 20 hours the barometer began to rise; at noon, estimated position, lat. $27^{\circ} 45'$ N., long. $51^{\circ} 03'$ W. of Greenwich, barometer 29.76 (756.0), rising. 9-10th: fresh s. winds, barometer 30.0 (762.0) weather cloudy, small rain, sea less violent and weather improving; at 12 hours laid on our course, full speed ahead, sky clearing."

The s. s. "Antonio Lopez," Dominguez, commanding, on the 6th had fresh s. to se. wind and rainy weather; at noon strong e. wind, high sea from s. and sw., barometer falling; position about N. 25° , W. 51° (longitude supposed w. of Greenwich). During the 7th the wind became stronger and was accompanied by heavy rain; at night it increased to a hurricane from e. and ene., with violent squalls and high sea from e., s., and sw.; at 20 hrs. the barometer rose slightly; at 22 hrs. the wind hauled to nne., and the barometer again fell; at 24 hrs. hard squalls from n., barometer rising. On the 8th sky clearing and barometer rising.

The vessel's position on the 7th is not given, but from the above report it would appear that she crossed the path of the cyclone and was to the northeastward of the vortex.

On the 8th, the bark "Norden," in N. 25° , W. 52° , had a hurricane, lasting from noon of that day until 6 p. m. of the 9th, in which she lost rigging, etc.

On the 11th the storm-centre moved in an easterly direction, passing to the southward of the bark "Superbo," which reported, as follows: 10th, in N. $28^{\circ} 00'$, W. $52^{\circ} 45'$, in the evening, sky obscured, fresh ssw. wind, heavy sea from same direction, barometer falling gradually; at night, wind increasing, with heavy squalls and high sea. On the 11th, at 4 a. m., the wind hauled from ssw. to s., with falling barometer; at 10 a. m., the wind hauled to e., barometer rising and weather improving; the wind afterwards hauled to ne.; position at noon of the 11th, N. $29^{\circ} 10'$, W. $54^{\circ} 10'$.

The data received at this office up to the present are not sufficient to show the track of this cyclone after the 11th; it is probable, however, that the disturbance traced as number 7 was closely connected with it, since hurricane winds and stormy weather prevailed near N. 30° , and between W. 50° and 55° , from the 11th to the 14th.

3.—This disturbance appeared on the 5th, near N. 50° , W. 29° . The s. s. "Zeeland," A. J. Griffin commanding, reported in N. $49^{\circ} 10'$, W. $29^{\circ} 0'$, barometer, 29.53 (750.0), being a fall of .35 inch; winds shifting from sw. to nw.; squally. On the same day the bark "Gloire," T. E. Blagdon commanding, in N. $48^{\circ} 40'$, W. $20^{\circ} 0'$, had a shift of wind from w. to sse., with falling barometer, and rain-squalls. By the following day the centre of disturbance had moved eastward, and was apparently central in Ireland.

4.—This was probably a continuation of the depression depression described as low area ii. under "Areas of low barometer." It crossed the Gulf of Saint Lawrence during the 5th, causing strong w. and nw. breezes to moderate gales in its southwest quadrant, and by the 6th it was central near N. 50° , W. 48° , the minimum pressure reported being 29.2 (741.7); as moderate gradients existed to the eastward of the centre, the winds did not exceed the force of a strong breeze. During the 6th the centre of disturbance appears to have moved south-eastward, and by the 7th the region of least pressure was near N. 47° , W. 42° , where the barometer ranged from 29.1 (739.1) to 29.27 (743.4), with light to moderate variable winds in that vicinity, and moderate n. gales to the westward of W. 45° . By the 8th the area of low barometer had moved northeastward and was shown near N. 51° , W. 35° , the barometric readings in that neighborhood ranging from 29.35 (745.5) to 29.55 (750.6); moderate to strong s. and sw. winds prevailed over the Atlantic from W. 25° eastward to the Irish coast, and w. and nw. winds were reported from W. 35° westward to the fifty-fifth meridian. By the 9th the disturbance had passed northward beyond the fifty-fifth parallel, the lowest observed barometric reading on that date being 29.48 (748.8), in N. 57° , W. 22° .

5.—This was a continuation of the depression traced over the United States and Canada, and described as low area iv., under "Areas of low barometer." On the 8th it was shown as a shallow depression, central near the Strait of Belle Isle. It moved eastward with decreasing pressure, and on the 9th, was central between N. 50° and 55° and near the fortieth meridian; the lowest reported barometer reading was 29.46 (748.3), wind ne., in N. 55° , W. 42° ; on the fiftieth parallel and between W. 35° and 45° , the winds were sw. and nw., moderate to strong in force. On the 10th and 11th the disturbance was north of N. 56° and west of the twenty-fifth meridian, the barometric readings from two vessels in that latitude being, respectively, 29.49 (749.0) and 29.68 (753.9), with sw. winds. On the 10th, the ship "Friedlander," in N. 55° , W. 24° , had a heavy gale from s. to w., in which she lost sails, and on the 11th, the ship "Carl," in N. $59^{\circ} 04'$, W. $24^{\circ} 56'$ had heavy gale from sw. to s., losing lower topsails.

6.—During the 10th a considerable decrease of pressure appears to have occurred over the ocean between N. 40° and 50° and W. 30° and 40° , and by the morning of the 11th the winds had shifted to e. and se., and the pressure in that region

ranged from 29.5 (749.3) to 29.6 (751.8). Northerly winds prevailed to the westward of W. 40°, and southerly winds to the eastward of W. 30°, but in the absence of steep barometric gradients, they remained moderate in force. By the morning of the 12th the pressure had decreased to 29.15 (740.4), the minima being shown near N. 46°, W. 30°. Moderate to strong n. and nw. gales now prevailed over the region between W. 35° and 45°, and N. 45° and 50°, with moderate to strong e., se., and s. breezes to the eastward of W. 35°. The reports for the 13th showed the area of low pressure to be near N. 51° W. 27°, but the depression was apparently filling in, and by the following day it had disappeared from the chart.

7. This disturbance, which was probably closely connected with the cyclone described as 2, has been traced as a separate disturbance, owing to absence of reliable reports between the 10th and 12th. On the last mentioned date the bark "Friedrich Scala," in N. 29°, W. 54°, had a severe gale from sse. to ssw., during which she lost several spars; and the brig "Emanuele," on the 13th, in N. 28° 40', W. 52° 37', had a gale from ssw., which lasted several days, causing much damage to the vessel. Vessels on the twenty-fifth parallel and near W. 58° had clear weather, with light w. and wnw. winds and high barometer. On the 14th the disturbance, having moved northeastward, was encountered by the brig "D. A. Small," in N. 32°, W. 46°, and by the s. s. "Marseille," in about N. 35°, W. 46°. The former vessel had winds of hurricane force from ssw., and lost sails, etc., and was under bare poles for five hours. The log of the s. s. "Marseille," L. Ruellan commanding, gives the following data: ship's position at noon, N. 34° 50', W. 46° 05'; at 1 p. m., barometer 29.76 (756.0), wind s., force 6; 2 p. m., barometer 29.45 (748.0), wind se.; 3 p. m., barometer 29.29 (744.0), wind ese., force 8. From that hour until 5 p. m. the barometer fell to 29.02 (737.6), at which reading it remained stationary until 6 p. m., the wind increasing from ese. until it reached a force of 10. At 7 p. m. the wind was wnw., force 10, and blew from that direction until 9 p. m., barometer rising; at 10 p. m., wind w., force 9; 11 p. m., w., force 8; midnight, w., force 7, barometer 29.61 (752.0). During the storm the sea was very heavy and caused some slight damage to the vessel. On the 15th the s. s. "Weser," H. Bruns commanding, reported, in N. 42° 54', W. 38° 17', barometer 29.50 (749.3), a fall of .57 inch, wind shifting from sw. to se., force 5 to 6. On the 16th the region of least pressure was near N. 50°, W. 27°, attended by moderate s. to sw. gales, and rising barometer; by the following day the depression had apparently filled in.

8.—This storm, which was remarkable on account of the abnormal path of the centre, is a continuation of that described under "Areas of low barometer" as number vii. It apparently developed off the coast of Florida on the 10th, the earliest marine data in connection therewith being the report of Captain Vogel, of the s. s. "City of Palatka," running between Jacksonville, Florida, and Charleston, South Carolina, as follows: "Weather on the coast last night (9th) from Charleston to about fifteen miles south of Savannah, heavy sea bearing in from ese., and wind at the time from ne. to ene., force from 8 to 19 knots, the latter during squalls of rain and wind; overcast and very cloudy. The wind did not back to wnw. before 7 a. m. of the 11th."

The s. s. "Guadalupe," at Key West, Florida, on the 11th, had fine weather until the night of the 10th, when she had light rains and wind squalls between the Bahamas and the Florida peninsula. Other vessels plying between Havana and Key West reported pleasant weather during the early part of September.

During the 11th and 12th the storm-centre appears to have moved inland and was in South Carolina, being attended by very heavy rains at stations on the south Atlantic coast; during the last-mentioned date it moved off the coast into the Atlantic, where it rapidly increased in intensity and exhibited the characteristics of a tropical hurricane. Captain Percy, commanding the s. s. "Algiers," between N. 27° 55', W. 79°

35', and N. 36° 15', W. 74° 40', from the 11th to 14th, reported a phenomenal backing of the wind from sw. on the 11th, by way of e., to nne. on the 13th.

During the 12th, the wind shifted to ne. at stations on the North Carolina coast, and blew with the force of a strong breeze; by the 13th the ne. winds were felt at sea, where they increased to moderate or strong gales. Southerly and southeasterly winds were reported by vessels south of N. 35° and east of W. 73°. During the 13th, the following vessels experienced the severity of the ne. gales: the bark "Alabama," in N. 31° 30', W. 78° 30', had a heavy ne. gale lasting seventeen hours, during which she had decks swept, spars and sails carried away, and sustained other damage. The schooner "Five Brothers," about one hundred and forty miles east of Charleston, lost and split sails during a heavy ne. gale, which lasted forty-eight hours, and the small steamer "Dos Hermanos," was wrecked on the Frying Pan shoals, off the North Carolina coast, during the same gale.

During this day the atmospheric depression seems to have been of small diameter, as vessels bound southward, and those to the eastward, observed little or no barometric indication of the existence of so severe a storm. The disturbance moved southeastward; its course and the position of the centre being shown by the report of the German bark "Paul," on the 14th. The following is an extract from the log of that vessel for September 14 and 15, 1884, furnished by Captain Aug. Klatt:

Sunday 14th.—4 a. m., strong wind from wsw., lightning in nw., barometer, 30.20 (767.1); 5 a. m., blowing strongly from w. and nw., barometer, 29.85 (758.2); 8 a. m., ship on beam-ends, no sail set, blowing fearfully, barometer, 29.60 (751.8); 12 noon (N. 29° 10', W. 75° 0'), no sail set, very high sea, barometer, 29.50 (749.3); 4 p. m., same weather; some of the well-fastened sails were blown to pieces on the yards, ship all the time on her beam-ends, barometer, 29.20 (741.7); 6 p. m., weather moderating, barometer, 29.20 (741.7); 8 p. m., calm, high sea running, sky very bright, but barometer falling, 29.00 (736.6); 11 p. m., wind fell out from ne. with very heavy rain, barometer, 29.00 (736.6).

Monday, 15th.—12, morning, wind wearing back to nne., terrific squalls, rising barometer, 29.15 (740.4); 4 a. m., wind n., blowing at its strongest, heavy rain, barometer, 29.20 (741.7); 8 a. m., wind nnw., blowing at its strongest, heavy rain, barometer, 29.35 (745.5); 12 noon, wind nw., full gale, barometer, 29.50 (749.3); 4 p. m., wind nw., full gale, barometer, 29.55 (750.6); 8 p. m., wind nw., moderating at times, barometer, 29.70 (754.4); 12 midnight, wind wnw., moderating, very high sea, barometer, 29.80 (756.9). Ship's position at the finish of the hurricane, N. 27° 20', W. 73° 50'. Lost a whole suit of sails and had everything movable swept from the deck.

Captain Brown, commanding the s. s. "Grip Fast," reported: 14th, in N. 29° 14', W. 74° 48', at 4 a. m., wind sw., fresh; 8 a. m., shifted to nw. in a heavy gale, with high sea, barometer 29.8 (756.9); at 4 p. m., barometer 29.7 (754.4); 8 p. m., 29.5 (749.3), wind shifted to ne. and blew a strong gale, with thick, heavy rain squalls; at 2 p. m., lost foresail, jib, and maintop-mast stay-sail, and at 4 p. m. shipped a heavy sea, which completely filled the engine room and stoke hole.

The schooner "R. M. Walls," in about N. 33° 20', W. 75° 0', at noon of the 14th reported strong ne. wind with very high sea, barometer 30.1 (764.5), remaining stationary during the entire day; sun occasionally visible through mist and cloud.

The s. s. "Valencia," Samuel Hess, commanding, reported, "14th, in N. 29° 30', W. 70° 35', barometer 29.9 (759.4) wind s. by e., force 8, heavy sea from ssw.; at 9.45 wind suddenly veered to ssw. in a squall of hurricane force, with heavy rain and lightning; remainder of the day strong gales and squalls."

On the same date the schooner "Carrie E. Woodbury," L. Bryant, commanding, in N. 30° 40', W. 70° 05', had barometer 30.04 (763.0), wind e., force 6.

Captain R. de Echevarrieta, commanding the s. s. "Andes," reported as follows: at 5 a. m., on September 14th, the wind shifted from sse. to n. and increased in force very rapidly, with heavy rain and occasional flashes of lightning; after 3 p. m., the wind shifted gradually from n. until it reached ene. at 6 p. m. at which time it blew strongest; hove to from 8 p. m. till morning of the 15th; barometer at midnight 29.73 (755.1); ship's position at noon of the 14th, N. 30° 49', W. 74° 27'.

Strong ne. gales continued over the region north of the

thirty-third parallel and west of the seventieth meridian, and numerous disasters to shipping were reported.

The position of the storm-centre on the 15th cannot be determined from the data as yet to hand, but the following reports show its presence, probably at no great distance east of the schooner "R. M. Walls," in about N. 29°, W. 74°. That vessel, in N. 29° 27', W. 75° 29', had the wind about n. by e., barometer falling from 30.0 (762.0) at 11 a. m. to 29.35 (745.5) at 1 p. m.; during this time the air was full of mist and vapor, and a very heavy cross sea was running.

The s. s. "Grip Fast," in N. 30°, W. 75°, had a ne. hurricane all day, with barometer slowly rising from 29.8 (756.9) at 4 a. m. to 29.9 (759.4) at 4 p. m.

The s. s. "Andes," in N. 31° 22', W. 74° 46', had wind and sea slightly moderating, barometer 29.88 (758.9), wind from n. to e.

The schooner "Bonanza," in N. 31° 27', W. 77° 46', had heavy sea and strong easterly gale throughout the day.

Schooner "Carrie E. Woodbury," in N. 31° 5', W. 70° 50', reported barometer 29.94 (760.5), wind ene., force 7.

Captain Bryant, of the brig "Rachel Conley," reported: "on the 15th, at 10 a. m., very heavy rain and squalls, heavy cross sea, thunder and ball lightning around the horizon. The barometer stood at 30.1 (764.5), with slight variation, rising or falling, during the day; wind from se. to sw., blowing with great force during squalls; calm at intervals and then squalls. The weather continued the same during the 16th, with occasional calms and very high cross sea; barometer rose to 30.2 (767.1). Ship's position at noon of the 15th, N. 28° 04', W. 68° 16'; at noon of the 16th, N. 28° 55', W. 68° 23'."

An extract from the log of the Spanish steamer "Serra," in N. 31° 51', W. 76° 12', at noon of the 15th, states: "day began with tempestuous wind from nne., very heavy sea from n. and e., barometer 30.0 (762.0); at 8 hours, barometer 29.9 (759.4), sky of a hurricane-like appearance, wind from ne.; at 10 hours, barometer 29.7 (754.4); 14 hours, barometer read 29.6 (751.8), with confused sea from e., ne., and sw.; at 20 hours, barometer 29.2 (741.7)."

During the 15th the storm-centre appears to have moved very slowly southward. Its position on the 16th is indicated by the report of the schooner "R. M. Walls." The latitude and longitude of the schooner at the time she encountered the central calm are not stated; her position, however, may be approximately given as being between N. 28° and 29° and W. 74° and 75°. At midnight of the 15th the barometer read 29.20 (741.7). At 11.30 a. m. of the 16th the gale was at its height, barometer 29.18 (741.2), wind about n.; it then suddenly died out, leaving the vessel "wallowing in a dead calm in the trough of a very heavy sea," rain squalls passing. After about five minutes, during which the calm lasted, the wind suddenly burst out from wsw. and the barometer rose to 29.25 (742.9), but shortly fell again to 29.18 (741.2), at which reading it remained until 4 a. m. of September 17th, when it began to rise and the sea moderated. At noon of the 17th the ship was in N. 27° 50', W. 75° 59'. At sunset of that day the weather was clear, but the sky around the horizon was perfectly green; barometer 30.00 (762.0).

The s. s. "Serra" appears to have been in close proximity to the centre during the afternoon of the 16th. At noon of that date she was in N. 30° 40', W. 76° 3', and was on a southerly course. At 2 hours the barometer read 29.10 (739.1), wind n.; 4 hours, barometer 29.00 (736.6), wind extremely baffling; 6 hours, barometer stationary, wind nw.; 7 hours, barometer 29.05 (737.9). After this the barometer rose gradually and the wind moderated. Latitude on the 17th, 27° 30' N., longitude 75° 28' W.

The data are insufficient to determine the position of the storm-centre on the 17th, but the circulation of the winds, as shown by the reports at hand, seems to indicate that the centre had moved northward and was then north of the thirtieth parallel. The brig "Emeline," in N. 31° 01', W. 65° 12', had fresh sw. breezes; the schooner "Bonanza," N. 30° 20', W.

77° 48', had w. and nnw. gale with rain squalls; schooner "Carrie E. Woodbury," in N. 31° 12', W. 70° 30', had barometer 29.74 (760.5), wind ssw, force 7; s. s. "Muriel," in N. 30° 45', W. 69° 24', barometer 29.94 (760.5), wind sw., force 5; s. s. "San Marcos," in N. 29° 22', W. 79° 20', barometer 29.99 (761.7), wind nw., force 6.

On the 17th, the s. s. "Andes," in N. 32° 20', W. 75° 0', had barometer 29.64 (752.8), wind shifting from ene. to nw., weather clearing. At stations on the south Atlantic coast south of Hatteras the winds shifted to nw. and wnw., while vessels at sea, north of the thirty-fifth parallel, had strong ne. and nne. gales.

During the 17th, the s. s. "Benvenue," when about 400 miles ese. of Sandy Hook, encountered a hurricane, beginning at ssw., veering to s., e., and n., and lasting for 6 hours, during which the wind blew with great violence.

On the 18th the schooner "Anna Bell" had a heavy gale in N. 36°, W. 62°, during which she lost sails, had decks swept, and sustained damage to rigging; and on the 20th the bark "Haleyon" was abandoned in N. 40°, W. 60° 50', having encountered a hurricane from se. to nw. on the 18th, which reduced the vessel to a wreck.

These are the only reports which indicate the presence of this disturbance on the 18th; on that day westerly winds and pressures about 30.0 (762.0) prevailed over the ocean south of N. 33°, while easterly winds and low barometric readings were reported near the fortieth parallel.

On the 19th the disturbance was shown, with a well-defined cyclonic movement of the winds, near the Banks of Newfoundland; the following reports indicate its severity during this date:

The bark "Wellington," in about N. 42° 26', W. 55° 14', reported strong sw. wind and heavy sea; in the evening the wind increased to a hurricane from e., and at midnight it died out and backed to n. and then blew with renewed force until 4 a. m., when it was w. and moderating. The barometer fell from 30.2 (767.1) to 29.0 (736.6) in twelve hours.

The bark "Cito," on the 19th, near N. 44°, W. 50°, reported a terrific hurricane from ssw., which lasted for three hours, during which the vessel lost several sails; after a short lull the wind suddenly shifted to n., nnw., and wnw., and blew as fiercely as before, with a very heavy cross sea; the wind then gradually moderated, and was followed by fair weather. No record of the barometer was kept, but the officers of the vessel stated that the barometer fell nearly one inch during the hurricane and rose rapidly when the wind changed.

Captain Albers, commanding the s. s. "Rugia," reported, in about N. 44° 16', W. 53° 58': 3 a. m., wind southerly, weather threatening, rainy, barometer falling, minimum 29.57 (751.1), force of wind, 3 to 7. At 4.30 a. m. wind shifted from n. to nne., force 7, weather clearing, barometer rising. The wind afterward shifted to nw. and decreased in force. From 8 a. m. to noon a high sw. sea prevailed.

The ship "J. T. Berry," in about N. 41°, W. 58°, reported, 7 p. m., wind hauling from sse. to wnw. and blowing with hurricane force with very high sea; ship lost sails and spars.

Several vessels reported heavy weather on the southern edge of the Banks. By the 20th the pressure had increased to 30.2 (767.1) and above, over the region east of the fortieth meridian, and the area of low barometer was shown near N. 51°, W. 25°, where the readings ranged from 29.69 (754.1) to 29.90 (759.4), with moderate to strong nw. winds near W. 30° and w. winds on the fiftieth parallel. By the 21st the area of low pressures was to the northwestward of Ireland.

9.—This was probably a continuation of low area vi., which passed over the United States and Canada. On the 12th the centre of disturbance was near the Strait of Belle Isle, and by the 13th it had passed to the northeastward of Labrador and beyond the range of the observations. During its passage it caused strong gales from n. and wsw.; the s. s. "Ontario," W. P. Couch commanding, reported, in N. 53° 34', W. 48° 49', barometer 29.27 (743.4), wind wsw., force 6; at 1 a. m. of the 14th (100 miles east of Belle Isle), the barometer fell to 29.17

(740.9), and the wind blew with the force of a strong gale from nne.

10.—This is a continuation of the disturbance described as low area ix., under "Areas of low barometer." It passed over southern Labrador during the 17th, and on the 18th it was shown near N. 54°, W. 52°, in which region the pressure ranged from 29.38 (746.2) to 29.53 (750.6). It moved eastward during the day, and on the 19th its presence was indicated by the reports as near N. 53°, W. 42°, where the pressure was about 29.6 (751.8); after the 19th this disturbance cannot be traced as a distinct depression, having probably merged in low area 8, which appeared to the southeastward.

11.—On the 24th the reports of the barks "Daphne" and "Betzy" indicated the presence of a disturbance near N. 42°, W. 40°, both vessels having encountered winds of hurricane force on that date. By the following day the disturbance had reached N. 52°, W. 20°, in which region a decrease of pressure averaging .45 inch had occurred since the observation of the 24th. The s. s. "Saint Laurent," M. de Jouselin commanding, reported as follows: 24th. During the afternoon the barometer began to fall rapidly, with s. wind of force 5; at 2.20 p. m. it read 29.93 (760.2), and at 10.20 p. m. 29.77 (756.2). From midnight to 2 a. m. of the 25th the wind shifted from e. to ne. and slightly moderated. At 2.15 a. m. it suddenly shifted in a squall to nw. and blew with hurricane force for two hours. The barometer began to rise immediately after the change of wind. At 5 a. m. the weather cleared, but the wind continued to blow with a force of 8 until 3 p. m. when it moderated. At 2.30 a. m. of the 25th, in N. 50° 06', W. 31° 16', the lowest barometer reading was 28.79 (731.2), and by noon of that date it had risen to 29.85 (758.2). The bark "Amelia," in N. 46° 00', W. 37° 30', had a hurricane which lasted six hours, with barometer falling to 28.6 (726.4). Very heavy gales continued during the 25th and 26th over the region between N. 50° and 60° and W. 20° and 30°, the winds being from s. and sw. on the twentieth meridian and from w. and nw. in W. 30°. By the 27th the disturbance was near the British coasts.

12.—This is a continuation of the disturbance described as number xiii., under "Areas of low barometer." It passed northeastward over Labrador during the 25th, and was shown to the northward of N. 55° on the following day. On the 26th the bark "Fluorine," A. Wilson commanding, in N. 55° 04', W. 49° 20', reported barometer 29.3 (744.2), a fall of .36 inch, wind wnw., force 4, rough sea and cloudy weather. By the 27th the disturbance had passed beyond the range of the observations.

13.—This was a continuation of low area xv. It moved over the Gulf of Saint Lawrence during the 29th, and at the close of the month it appeared central off the eastern coast of Newfoundland, the lowest recorded pressure being 29.36 (745.7), wind sw., force 4. Strong s. breezes to moderate gales were reported over the ocean from W. 50° eastward to W. 40°, with moderate w. breezes to the southward of the Banks.

OCEAN ICE.

Chart i. also exhibits the southern and eastern limits of the region within which icebergs were observed in the north Atlantic ocean during the month of September, 1884. These limits are determined from reports sent to this office by shipmasters; reports furnished through the co-operation of the "New York Herald Weather Service," and from other data published in the "New York Maritime Register."

In September, 1884, the southern limit of the ice-region was about N. 46°, and its eastern limit was near W. 49°. Few icebergs have been observed in the routes of trans-Atlantic steamers, but large masses of ice are reported near the eastern coast of Newfoundland; they are also reported on the southern coast, between Cape Race and Saint Pierre. Icebergs were also encountered between W. 40° and 45° and north of the fifty-fifth parallel.

As compared with the chart for the preceding month (August),

there has been a notable decrease in the extent of the ice-region; its eastern limit in September being about 5° west of that for the preceding month, while its southern boundary is about 2° 30' north of the August limit.

In September, 1883, not more than half a dozen icebergs were observed within the region between W. 44° and the Newfoundland coast, and none were reported south of N. 48°. In the same month of 1882 no icebergs were reported.

Icebergs were observed during September, 1884, as follows:

Captain D. Thoms, commanding the brigantine "Corisande," reported: "August 31st, passed a large number of icebergs within a radius of twenty miles of Bonavista light house; about twenty miles sse. of Bonavista passed a large ice-land about four miles long, extending from e. to w., and about two miles broad, and having a height of from 100 to 200 feet. As we continued on our course we passed a large number of large and small bergs, until off Fogo, when the vessel had to be steered clear of broken ice for about six miles; then got into clear water. On September 4th, arrived at Loup Bay, Labrador, passing four small icebergs in the Strait of Belle Isle; on the 25th, in N. 51° 35', W. 54° 40', passed a large iceberg, and on the 27th saw a large ice-land and several small bergs off Cape Spear."

September 2d.—Captain Wilson, commanding the bark "Fluorine," reported: "On the 2d passed a large iceberg in N. 48° 50', W. 50° 49'. 3d.—In N. 51° 43', W. 50° 50' also passed a large iceberg; same day, from N. 51° 56' to N. 52° 32', passed eight icebergs within four miles of vessel's track on a due north course. September 5th, sighted a few icebergs near the Greenland coast. On the 8th, 9th, and 10th very many icebergs in sight."

September 4th.—S. S. "Lake Huron," from 180 miles east of Belle Isle to Belle Isle, passed several large and small icebergs.

10th.—S. S. "Lord Gough," in N. 47° 39', W. 49° 14', passed a large but low iceberg.

19th.—Bark "Armeuia," in N. 56°, W. 40° to 45°, passed six icebergs.

24th.—S. S. "Norwegian," off Cape Race, passed three large icebergs.

British s. s. "Bristol," from Montreal for Bristol, at Saint John's on September 27, reported having passed three hundred and seventy-five icebergs between Cape Freels and Cape Race.

28th.—S. S. "Saint Laurent," fifteen miles ese. of Cape Race, passed an iceberg.

October 2d.—S. S. "Illinois," in N. 46° 06', W. 53° 21', passed several large and small icebergs. Schooner "Busiris," at North Sidney, reported having seen forty-three large and small icebergs between Cape Spear and Cape Race.

3d. S. S. "Normandie," from N. 46° 27', W. 55° 21' to N. 46° 18', W. 55° 51', passed thirteen icebergs, some of large dimensions.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada, for September, 1884, is exhibited on chart ii., by the dotted isothermal lines; and chart iv. shows the departures from the September normal. From an examination of the last-named chart it will be seen that the mean temperature is above the normal at all stations east of a line running from southern New Mexico, near El Paso, Texas, to the northern boundary of Dakota, with the exception of Jacksonville and Key West, Florida, where the temperature is slightly below the normal. Over an area extending from northern Texas, northeastward to the lake region and Ohio valley, the mean temperatures are from 5° to 6° above the normal. To the westward of the line of normal temperature, the means are below the September normal, the departures being marked in the northern and middle plateau districts and in the north and middle Pacific coast regions.

In the following table are shown for each of the several geo-